

CLAIMS

What is claimed is:

1. A protection circuit comprising: a control circuit (43) for controlling switching of at least one switch (36, 37) of a floating power transfer device, the at least one switch (36, 37) controlling charging of a reservoir capacitor (35) of the floating power transfer device across which a load is applied when in use; a fault detection circuit (33) for detecting a fault in at least one of the floating power transfer device or the load, and for sending a fault detect signal to the control circuit (43) responsive thereto; and a precharge driver circuit (47) for pre-charging the reservoir capacitor, the precharge driver circuit (47) being enabled by the control circuit (43) responsive to receipt of the fault detect signal from the fault detection circuit (33), wherein when enabled, the precharge driver circuit (47) attempts to precharge the reservoir capacitor (35) to a voltage level sufficient for switching of the at least one switch to proceed without damaging the at least one switch.

2. The protection circuit of claim 1, wherein the fault detection circuit (33) resides in a floating portion of the floating power transfer device and the control circuit (43) resides in a ground referenced portion of the floating power transfer device, and wherein the protection circuit further comprises a float level shift circuit (34) for shifting the fault detect signal from the floating portion of the floating power transfer device to the ground referenced portion for forwarding to the control circuit (43).

3. The protection circuit of claim 1, wherein the fault detection circuit (33) further comprises circuitry for directly or indirectly monitoring when voltage across the reservoir capacitor of the floating power transfer device falls below a fault threshold, and for sending the fault detect signal to the control circuit responsive thereto.

4. The protection circuit of claim 1, wherein the floating power transfer device further comprises a power supply having a voltage level in a range of 5 to 20 volts, the power supply charging the reservoir capacitor of the floating power transfer device when the at least one switch (36, 37) is turned on.

5. The protection circuit of claim 4, wherein the at least one switch comprises two switches (36, 37) operated in tandem for cyclically applying the power supply voltage across the reservoir capacitor (35) to charge the capacitor.

6. The protection circuit of claim 1, further comprising a temperature sensor for detecting when temperature of the at least one switch rises above a set temperature level, and for sending an over temperature signal to the control circuit responsive thereto, and

wherein the control circuit further comprises means for temporarily shutting down the floating power transfer device and subsequently reinitiating a startup procedure responsive to receipt of the over temperature signal.

7. A device comprising: a reservoir capacitor (35) across which a load (50) is applied when in use; a power supply voltage for charging the reservoir capacitor (35); at least one switch (36, 37) coupled between the power supply voltage and the reservoir capacitor (35) to selectively connect and disconnect the power supply voltage from the reservoir capacitor (35); and a protection circuit for the at least one switch, the protection circuit including: a control circuit (43) for controlling switching of the at least one switch (36, 37) of the device, a fault detection circuit (33) for detecting a fault in at least one of the device or the load, and for sending a fault detect signal to the control circuit (43) responsive thereto, and a precharge driver circuit (47) for precharging the reservoir capacitor (35), the precharge driver circuit (35) being enabled by the control circuit (43) responsive to receipt of the fault detect signal from the fault detection circuit (33), and wherein when enabled, the precharge driver circuit (47) attempts to precharge the reservoir capacitor (35) to a voltage level sufficient for switching of the at least one switch (36, 37) to proceed without damaging the at least one switch (36, 37).

8. The device of claim 7, wherein the fault detection circuit (33) resides in a floating portion of the floating power transfer device and the control circuit (43) resides in a ground referenced portion of the floating power transfer device, and wherein the protection circuit further comprises a float level shift circuit for shifting the fault detect signal from the floating portion of the floating power transfer device to the ground referenced portion for forwarding to the control circuit (43).

9. The device of claim 7, wherein the fault detection circuit (33) further comprises circuitry for directly or indirectly monitoring when voltage across the reservoir capacitor (35) falls below a fault threshold, and for sending the fault detect signal to the control circuit (43) responsive thereto.

10. The device of claim 7, wherein the power supply (49) has a voltage level in a range of approximately 5 to approximately 20 volts and the power supply charges the reservoir capacitor (35) when the at least one switch (36, 37) is turned on.

11. The device of claim 10, wherein the at least switch comprises two switches (36, 37) operated in tandem for cyclically applying the power supply voltage across the reservoir capacitor (35) to charge the capacitor.

12. The device of claim 7, wherein the protection circuit further comprises a temperature sensor for detecting when temperature of the at least one switch rises above a set temperature level, and for sending an over temperature signal to the control circuit responsive thereto, and wherein the control circuit further comprises means for temporarily shutting down the floating power transfer device and subsequently reinitiating a start-up procedure responsive to receipt of the over temperature signal.

13. A method comprising: controlling switching of at least one switch (36, 37), the at least one switch controlling charging of a reservoir capacitor (35) of a floating power transfer device across which a load (50) is applied when in use; monitoring at least one of the floating power device and the load (50) for detecting a fault, and upon detecting a fault, generating a fault detect signal; and responsive to generating of the fault detect signal, attempting to precharge the reservoir capacitor (35) to a voltage level sufficient for switching of the at least one switch (36, 37) to proceed without damaging the at least one switch.

14. The method of claim 13, wherein the controlling is performed from a ground referenced portion of the floating power transfer device and the monitoring is performed from a floating portion of the floating power transfer device, and wherein the method further comprises level shifting the generated fault detect signal from the floating portion to the ground referenced portion for use in initiating the attempting to precharge the reservoir capacitor.

15. The method of claim 13, wherein the monitoring comprises monitoring directly or indirectly when voltage across the reservoir capacitor (35) falls below a fault threshold, and for generating the fault detect signal responsive thereto.

16. The method of claim 13, wherein charging of the reservoir capacitor (35) of the floating power transfer device is from a power supply having voltage level in a range of 5 to 20 volts, wherein the power supply (49) charges the reservoir capacitor of the floating power transfer device when the at least one switch is turned on.

17. The method of claim 16, wherein the at least one switch comprises two switches (36, 37) operated in tandem for cyclically applying the power supply voltage across the reservoir capacitor (35) to charge the capacitor.

18. The method of claim 13, further comprising monitoring temperature of the at least one switch (36, 37), and generating an over temperature signal when the temperature of the at least one switch (36, 37) rises above a set temperature level, and wherein the

method further comprises temporarily shutting down the floating power transfer device and subsequently reinitiating a start-up procedure responsive to generating of the over temperature signal.

19. A circuit comprising: means for controlling switching of at least one switch (36, 37), the at least one switch (36, 37) controlling charging of a reservoir capacitor (35) of a floating power transfer device across which a load (50) is applied when in use; means for monitoring at least one of the floating power device and the load for detecting a fault, and upon detecting a fault, for generating a fault detect signal; and means for attempting, responsive to generating of the fault detect signal, to precharge the reservoir capacitor (35) to a voltage level sufficient for switching of the at least one switch to proceed without damaging the at least one switch.